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Prescription medication use by Canadians aged 6 to 79

by Michelle Rotermann, Claudia Sanmartin, Deirdre Hennessy and Michele Arthur

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.   not available for any reference period
..   not available for a specific reference period
... not applicable
0   true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p   preliminary
r   revised
x   suppressed to meet the confidentiality requirements of the *Statistics Act*
E   use with caution
F   too unreliable to be published
*   significantly different from reference category ($p < 0.05$)

Prescription medication use by Canadians aged 6 to 79

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Abstract

Based on data from the 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, this article provides national information about prescription medication use among community-dwelling Canadians. An estimated 41% of 6- to 79-year-olds who lived in private households reported taking at least one prescription medication in the past two days (current use). Generally, prescription drug use was higher among females and among people in poorer health, and increased with age. Approximately 11% of 45- to 64-year-olds and 30% of seniors aged 65 to 79 took at least five prescription medications concurrently. For adults aged 25 to 79, the leading prescription medication classes were lipid-lowering agents, ACE-inhibitors, peptic-ulcer and acid-reducers, beta-blockers (men), other analgesics and anti-pyretics (men), anti-depressants (women) and thyroid medication (women). Among children and young adults aged 6 to 24, the leading prescription medications were for attention deficit and hyperactivity disorder (males), depression, and hormonal contraception (females).

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Prescription medications are the second most costly component of health care, accounting for almost 14% ($29 billion) of Canada's annual health care spending in 2013.[1] This largely reflects pharmacological management of chronic diseases and conditions (for instance, heart disease and high cholesterol,[2] hypertension,[3] diabetes[4] and depression[5]) and pregnancy prevention.[6]

Despite the pervasive use of prescription medications, few national data sources are capable of supporting research. Some have restricted generalizability[7]; others are not population-based.[7,8] The socio-demographic information in administrative dispensary or billing databases is also limited.[7-9] Survey data, too, are problematic—most national surveys with prescription medication content are outdated or restricted to medications with specific indications.[10-12]

This analysis uses results from the combined 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey (CHMS) to estimate the prevalence of prescription medication use, profile medication users, and identify the most common prescription medication classes used by the household population aged 6 to 79 (see *The data*).

Prescription medication use

According to results of the 2007 to 2011 CHMS, 41% of community-dwelling 6- to 79-year-olds had taken at least one prescription medication within two days of their household interview (Table 1). This

was lower than the 48% who reported to the 2007-2008 National Health and Nutrition Examination Survey (NHANES) in the United States[13] that they had used prescription medication in the past month. Also, unlike the American data, the CHMS estimate excludes people aged 80 or older, a group known to be heavier users of medication.

Reflecting a well-established association,[8,10,14] prescription drug use rose with age from 12% among 6- to 14-year-olds to 83% among 65- to 79-year-olds.

Prescription drug use was also associated with the presence of physical and mental health conditions. Nearly all respondents who had four or more of the chronic conditions examined in this analysis reported taking prescription drugs in the past two days. Among people with at least three chronic conditions, the percentages were more than 90%; for those with none of the selected conditions, the figure was 22%. Similarly, the percentage of people reporting prescription medication use rose with increasing levels of disability and pain, and with lower levels of self-perceived health and emotional well-being.

The data

The Canadian Health Measures Survey (CHMS) is conducted by Statistics Canada in partnership with the Public Health Agency of Canada and Health Canada. The survey was designed to produce nationally representative estimates.[15] It excludes people living on reserves and other Aboriginal settlements in the provinces, full-time members of the Canadian Forces, the institutionalized population, and residents of some remote regions, all of whom together make up less than 4% of the target population.[16] Ethics approval for the CHMS was obtained from Health Canada's Research Ethics Board.[17]

Data collection was completed in two steps: an interview at the respondent's home and a visit by the respondent to the CHMS mobile examination centre where physical measures and blood and urine samples were taken.

Cycle 1 took place from March 2007 through February 2009, and collected information from respondents aged 6 to 79 living in private households in 15 locations across Canada. Cycle 2 took place from August 2009 through November 2011, and collected data from respondents aged 3 to 79 living in private households in 18 locations.

Of households selected for cycles 1 and 2, 72.7% agreed to participate, and 89.3% of selected household members completed the household questionnaire. A total of 11,387 respondents completed the mobile examination centre component. After adjustments for the sampling strategy, the final response rate for 6- to 79-year-olds for the two cycles combined was 53.5%.[16]

The sample for the present study consists of 11,386 respondents aged 6 to 79 from both cycles who provided viable information about their use of prescription drugs. One record was dropped because all prescription medication-related fields were missing.

To account for survey design effects, coefficients of variation and 95% confidence intervals were estimated with the bootstrap technique.[18] Differences between prevalence estimates were calculated with t-tests. All analyses were conducted in SUDAAN v.10 (RTI International, Research Triangle Institute, NC, USA), using weighted data and DDF = 24 in the procedure statements to account for the degrees of freedom of the combined datasets. Details about the CHMS, including sampling, design, quality assurance and combining cycles, are available elsewhere.[15-17]

Drug identification numbers (DINs) were collected from medication containers during the household interview and verified during the mobile examination centre visit. Current medication use was defined as any medication taken by the respondent on either the day of the household interview or the previous day; up to 15 medications were recorded for each respondent.

Each DIN has a World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) classification code assigned by Health Canada.[19] The ATC structure divides active substances into groups according to the organ or system on which they act and their therapeutic, pharmacological and chemical properties. There are five levels of classification. The first level is the main group. The second defines pharmacological/therapeutic subgroups; the third and fourth define chemical/pharmacological/therapeutic subgroups. The fifth level represents the chemical substance.

For this analysis, the leading prescription medication classes are defined using level-3 ATC codes, which represent major therapeutic or pharmacological subgroups (Appendix). Respondents who reported taking more than one drug in a level-3 ATC subgroup were represented only once in that group. DINs provided by 147 respondents, which could not be coded, were retained in the analysis as part of a "missing" category.

Based on the literature and availability in the CHMS, prescription medication use was examined by selected socio-demographic and health status indicators. Five age groups were specified: 6 to 14, 15 to 24, 25 to 44, 45 to 64, and 65 to 79. The prevalence of eight health conditions (diagnosed by a health professional) was determined—hypertension (including individuals who reported taking high blood pressure medication), asthma, diabetes, heart disease (including heart attack), arthritis, cancer, chronic obstructive pulmonary disorder (COPD) (including emphysema, chronic bronchitis, chronic pulmonary disease), and mood disorders such as depression or bipolar disorder. The number of conditions reported by each respondent was categorized as 0, 1, 2, 3, or 4 or more. Four disability levels (no, mild, moderate or severe) were assigned based on respondents' Health Utility Index scores. Respondents were categorized as usually free of pain and discomfort or not, and by health status (excellent/very good, good or fair/poor).

Logistical and budgetary constraints limited the number of CHMS collection sites and sample size.[16] Consequently, this analysis sometimes uses more general covariate categories than would have been desirable. As well, not all relevant covariates were available—for example, insurance coverage and prescription medication dose and duration. Small sample sizes may also have reduced the ability to identify statistical significance.

Because the CHMS was designed to produce national estimates,[16] it was not possible to examine prescription medication use by province.

The survey captured a maximum of 15 prescription medications; consequently, use may be underestimated. Also, the use of medications or equivalents that are available both as prescriptions and over-the-counter may be underestimated. As well, the CHMS excludes people aged 80 or older and residents of institutions, so estimates of prescription medication use are lower than they would have been if these populations had been included.

Although survey weights ensured that the sample is representative of the target population, bias may exist if the medication use of respondents and non-respondents differed systematically.

Self-reported data are susceptible to social desirability and recall biases. However, this study may overcome problems associated with administrative or billings-based data. Because patients do not always take dispensed medication,[20] data on prescription medication use rather than acquisition, which is what is normally captured by dispensary and retail sales data, may be more accurate. Also, population-based survey data are more generalizable than administrative or billings-based data, which pertain only to people with insurance or public drug program coverage.

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The percentage of Canadians taking prescription drugs did not differ by household income. This is contrary to some other studies, which found that individuals at either income extreme tend to use more medications,[21] or that medication use was inversely related to family income,[20] material deprivation,[22] and insurance status.[19]

Females were generally more likely than males to report taking prescription medications (47% versus 34%). However, at ages 6 to 14, a higher percentage of boys than girls used pre-scription medications, and at ages 65 to 79, the prevalence of prescription drug use was similar for men and women.

Women's gynecological and repro-ductive health needs, in addition to differences in illness and health-seeking behaviour, likely account for the dif-ference in prescription drug use by sex. Studies of health care service utilization in general have also frequently found higher use by women during the adult reproductive years, followed by a period of more balanced use, and higher use by men in later life.[23]

Intensity

Prescription drug use intensity—the number of different medications taken—was strongly associated with age. The percentage taking more than one medica-tion rose from 3% at ages 6 to 14 to 70% at ages 65 to 79 (Table 2).

Consistent with other Canadian esti-mates,[12,24] polypharmacy—taking at least five prescription medications concur-rently—was highest at approximately 30% among 65- to 79-year-olds. At ages 45 to 64, 11% used five or more prescription medications. Polypharmacy

Table 1
Percentage using prescription medication, by sex and selected characteristics, household population aged 6 to 79, Canada, 2007 to 2011

	Total			Males			Females		
	%	95% confidence interval		%	95% confidence interval		%	95% confidence interval	
	%	from	to	%	from	to	%	from	to
Total	40.5	38.1	42.9	34.5‡	31.9	37.0	46.5	43.6	49.4
Age group									
6 to 14†	11.7	9.7	13.8	14.0‡	11.3	16.6	9.3	7.0	11.5
15 to 24	26.2*	21.4	31.1	12.6‡	8.7	16.4	40.3*	33.1	47.5
25 to 44	28.0*	25.2	30.9	20.8*‡	18.1	23.4	35.3*	29.8	40.8
45 to 64	55.1*	51.4	58.8	50.2*‡	44.3	56.1	59.7*	56.5	63.0
65 to 79	82.7*	79.5	85.9	83.2*	79.7	86.8	82.2*	77.9	86.5
Household income quintile									
Not lowest†	40.8	38.4	43.2	34.6‡	32.1	37.1	47.0	44.0	50.1
Lowest 20%	36.4‡	22.0	50.8	33.4‡	13.6	53.2	37.9‡	21.5	54.4
Number of selected chronic conditions									
None†	21.6	19.6	23.7	14.8‡	12.7	17.0	28.8	25.4	32.3
1	60.6*	57.0	64.3	57.8*	51.6	64.1	63.2*	57.5	68.9
2	83.7*	79.1	88.3	83.3*	75.5	91.0	84.0*	79.0	89.1
3	92.4*	87.9	97.0	92.9*	86.3	99.4	92.1*	85.9	98.3
4 or more	99.2*	98.3	100.0	98.5*	96.2	100.0	99.8*	99.4	100.0
Disability									
None†	23.5	20.8	26.2	17.8‡	14.6	21.0	30.3	26.3	34.4
Mild	40.9*	37.8	44.0	36.0*‡	31.2	40.7	45.6*	42.6	48.6
Moderate	48.0*	42.7	53.3	43.1*	35.7	50.5	52.5*	44.5	60.4
Severe	66.2*	61.5	70.9	58.6*‡	51.0	66.3	72.6*	66.1	79.1
Usually free of pain/discomfort									
Yes†	35.1	32.9	37.3	29.7‡	27.2	32.3	40.7	38.2	43.3
No	63.7*	59.2	68.2	57.9*‡	52.2	63.5	68.3*	62.4	74.3
Self-perceived health									
Very good/Excellent†	31.7	29.4	34.1	24.9‡	21.8	28.0	38.8	35.7	41.9
Good	47.1*	43.5	50.7	41.8*‡	36.9	46.8	52.2*	47.7	56.6
Fair/poor	67.0*	60.8	73.2	66.3*	58.3	74.3	67.6*	60.2	75.0
Emotional well-being									
Happy/Somewhat happy†	39.8	37.4	42.2	33.7‡	31.0	36.3	45.9	43.0	48.8
Somewhat unhappy/Unhappy/Very unhappy	60.0*	51.0	69.0	57.3*	46.1	68.4	62.8*	48.8	76.7

† reference category
* significantly different from reference category (p < 0.05)
‡ significantly different from females (p < 0.05)
E use with caution
Note: Percentages refer to prescription medication taken within two days of Canadian Health Measures Survey household interview
Source: 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

was rare—1.5% or less—among children and younger adults.

Although concurrent use of several prescription medications can increase the risk of adverse drug events, especially among seniors,[25,26] multiple medication use can be difficult to avoid, as drugs taken to treat one condition may induce or worsen other conditions, a situation that, in turn, can necessitate additional medications.[3,27,28]

Leading drug classes

The leading prescription medications used by children and young adults (ages 6 to 24) were for attention deficit and hyperactivity disorder (ADHD) (males), depression, and contraception (females) (Table 3, Appendix). At ages 6 to 14, adrenergic inhalants, typically taken to manage asthma, were also common.

Among 25- to 79-year-olds, the leading prescription medication classes were lipid-lowering agents, ACE-inhibitors, peptic-ulcer and acid-reducers, beta-blockers (men), other analgesics and anti-pyretics (men), anti-depressants (women), and thyroid medication (women) (Table 4, Appendix).

Because illnesses and other indications for medications vary over the life course, so do the leading medication classes. This is especially the case for women whose drug use up to age 45 is

Table 2
Percentage using prescription medication, by age group and number of medications, household population aged 6 to 79, Canada, 2007 to 2011

	Age group																	
	Total 6 to 79			6 to 14			15 to 24			25 to 44			45 to 64			65 to 79		
		95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval	
Number of medications	%	from	to	%	from	to	%	from	to	%	from	to	%	from	to	%	from	to
1	16.2	14.8	17.6	8.3	6.5	10.2	19.7	15.9	23.5	17.0	14.4	19.5	17.7	15.0	20.5	12.9	10.6	15.1
2	8.8	7.7	9.9	2.6	1.8	3.3	4.9ᶠ	2.9	6.9	6.3	4.7	7.9	13.1	10.9	15.4	15.0	11.8	18.2
3	4.6	3.9	5.3	0.7ᴱ	0.4	1.0	<3.2†	...	...	2.0	1.3	2.6	7.2	5.7	8.7	13.5	10.9	16.1
4	3.5	2.9	4.1	F	...	...	F	...	...	1.3ᶠ	0.6	2.0	5.7	4.4	6.9	11.4	9.2	13.6
5 or more	7.4	6.7	8.1	F	...	...	F	...	...	1.5ᶠ	0.8	2.3	11.4	9.1	13.7	29.9	27.0	32.9

† if coefficient of variation exceeds 33.3%, but cell contains at least 10 records, estimate indicated as being less than upper limit of 95% confidence interval
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Note: Percentage refers to prescription medication taken within two days of Canadian Health Measures Survey household interview.
Source: 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

Table 3
Top two prescription medications used, by sex, age group and medication class, household population aged 6 to 24, Canada, 2007 to 2011

	Males					Females				
		Prevalence						Prevalence		
			95% confidence interval						95% confidence interval	
Age group, medication class	Number '000	%	from	to		Age group, medication class	Number '000	%	from	to
Total 6 to 24						**Total 6 to 24**				
ADHD psycho-stimulants and nootropics	146.2ᴱ	3.6	2.4	4.8		Systemic use hormonal contraceptives	494.3	13.0*	10.3	15.6
Anti-depressants	67.7ᴱ	1.7	0.7	2.6		Anti-depressants	<280.3†	<7.3†		
6 to 14						**6 to 14**				
ADHD psycho-stimulants and nootropics	106.1	5.9*	4.0	7.9		ADHD psycho-stimulants and nootropics	40.1ᴱ	2.5	1.5	3.5
Adrenergics, inhalants	44.1ᴱ	2.5	0.8	4.1		Adrenergics, inhalants	16.0ᴱ	1.0	0.4	1.6
15 to 24						**15 to 24**				
Anti-depressants	49.0ᶠ	2.2	0.8	3.5		Systemic use hormonal contraceptives	482.1	21.9*	17.6	26.1
ADHD psycho-stimulants and nootropics	<72.9†	<3.2†	...	...		Anti-depressants	<275.9†	<12.3†		

* significantly different from estimate for opposite sex (p < 0.05)
† if coefficient of variation exceeds 33.3%, but cell contains at least 10 records, estimate is indicated as less than upper limit of 95% confidence interval
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Note: Respondents taking more than one drug in medication class are reflected in that class only once.
Source: 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

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dominated by contraceptives, and then gives way to drugs such as estrogens, a type of hormone replacement therapy. Treatment of symptoms and risk factors associated with cardiovascular disease drives a considerable part of men's medication use. Additionally, for men, the use of "other analgesics and anti-pyretics," typically to treat pain and stiffness, was common. For both sexes, anti-depressant use peaked at ages 45 to 64 (17% among women and 8% among men).

Comparisons with analyses based on administrative data, such as the National Prescription Drug Utilization Information System database or province-specific estimates, and with American research show similarities in the most frequently used and/or most expensive drug classes, including medication for asthma, ADHD and anti-depressants among children and young adults, and cholesterol-lowering drugs, blood pressure medication, analgesics, beta-blockers and anti-depressants among older adults.[8,13,29-31]

Conclusion

This is the first national, population-based study to provide detailed information about current prescription drug use

Table 4

Top five prescription medications used, by sex, age group and medication class, household population aged 25 to 79, Canada, 2007 to 2011

Men					Women				
			Prevalence					Prevalence	
				95% confidence interval					95% confidence interval
Age group, medication class	Number '000	%	from	to	Age group, medication class	Number '000	%	from	to
Total 25 to 79					**Total 25 to 79**				
Lipid-modifying agents, plain	1,697.6	15.9*	14.0	17.7	Anti-depressants	1,514.0	13.7*	11.3	16.1
Ace inhibitors, plain	978.1	9.1*	7.6	10.7	Lipid-modifying agents, plain	1,205.2	10.9	9.3	12.5
Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	836.3	7.8	6.1	9.5	Thyroid	1,082.5	9.8*	8.3	11.3
Beta-blocking agents	730.3	6.8*	5.6	8.1	Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	1,011.8	9.2	7.5	10.8
Other analgesics and anti-pyretics	677.7	6.3*	5.4	7.3	Ace inhibitors, plain	659.6	6.0	4.9	7.1
25 to 44					**25 to 44**				
Anti-depressants	190.8ᴱ	4.2*	2.4	6.0	Systemic use hormonal contraceptives	513.1	11.4*	8.5	14.3
Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	163.9ᴱ	3.6	1.9	5.4	Anti-depressants	415.2	9.3ᴱ	6.0	12.5
Adrenergics, Inhalants	89.9ᴱ	2.0	0.8	3.2	Thyroid	194.5	4.3ᴱ	2.6	6.1
Lipid-modifying agents, plain	<149.2†	<3.3†	...	...	Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	119.1	2.7ᴱ	1.4	3.9
Ace inhibitors, plain	77.1ᴱ	1.7*	0.9	2.5	Adrenergics, inhalants	105.3	2.3ᴱ	1.5	3.2
45 to 64					**45 to 64**				
Lipid-modifying agents, plain	877.0	18.9*	15.7	22.0	Anti-depressants	846.4	17.2*	14.3	20.2
Ace inhibitors, plain	477.7	10.3*	7.8	12.7	Lipid-modifying agents, plain	563.9	11.5	8.8	14.2
Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	421.7ᴱ	9.1	5.9	12.2	Thyroid	536.7	10.9*	8.5	13.4
Anti-depressants	381.9	8.2	5.6	10.9	Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	522.2	10.6	8.0	13.2
Other analgesics and anti-pyretics	364.7	7.8*	6.1	9.6	Estrogens	325.9	6.6*	4.9	8.4
65 to 79					**65 to 79**				
Lipid-modifying agents, plain	738.7	47.9*	42.0	53.7	Lipid-modifying agents, plain	584.7	35.6	30.6	40.6
Ace inhibitors, plain	422.7	27.4*	21.5	33.3	Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	370.4	22.5	17.6	27.4
Beta-blocking agents	359.7	23.3*	17.8	28.9	Thyroid	351.2	21.4*	16.9	25.8
Other analgesics and anti-pyretics	281.7	18.3	14.5	22.0	Ace inhibitors, plain	304.9	18.5	14.4	22.7
Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	250.7	16.3	11.5	21.0	Beta-blocking agents	275.3	16.7	12.7	20.8

* significantly different from estimate for opposite sex (p<0.05)
† if coefficient of variation exceeds 33.3%, but cell contains at least 10 records, estimate is indicated as being less than upper limit of 95% confidence interval
ᴱ use with caution
... not applicable
Note: Respondents taking more than one drug in medication class are reflected in that class only once.
Source: 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

among community-dwelling Canadians aged 6 to 79. Prescription medications are widely used by the household population, and polypharmacy is common. As might be expected, distinct patterns of prescription medication use emerge by age and sex, and generally reflect physical and mental health status, as well as women's gynecological and reproductive health needs. Leading medication classes for youth and adults were largely consistent with other Canadian and American research. As additional waves of CHMS data become available, it will be possible to combine successive cycles for more detailed investigation of prescription drug use in Canada. ■

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Appendix

Three-level Anatomical Therapeutic Chemical (ATC) classification codes, descriptions, and common uses of leading medications

ATC code	ATC description	Common uses, examples, alternate names
A02B	Drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)	Peptic ulcers and GORD; such as proton pump inhibitors (PPIs)
C07A	Beta-blocking agents	High blood pressure, heart failure, angina (chest pain)
C09A	Ace inhibitors, plain	Heart failure, high blood pressure
C10A	Lipid-modifying agents, plain	High cholesterol; such as statins
G03A	Systemic use hormonal contraceptives	Pregnancy prevention; such as oral and patch contraceptives
G03C	Estrogens	Manage menopausal symptoms; type of hormone replacement therapy (HRT)
H03A	Thyroid	Low thyroid function (hypothyroidism)
N02B	Other analgesics and anti-pyretics	Pain; prevention of stroke/heart attack
N06A	Anti-depressants	Mood disorders and depression; such as anti-depressants including serotonin reuptake inhibitors
N06B	ADHD psycho-stimulants and nootropics	Symptoms related to attention deficit and hyperactivity disorder (ADHD)
R03A	Adrenergics, inhalants	Treatment of asthma, chronic bronchitis, emphysema, etc.; brochodilators

Source: World Health Organization.